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IPM Demonstrations in Peppers

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Abstract
IPM procedures for peppers, developed in Connecticut, were demonstrated on three farms in western NY. Growers followed thresholds for aphids and European corn borer, and two of the growers planted a bacterial leaf spot (BLS)-resistant variety in the IPM portion of the field. Because the New England procedures use European corn borer (ECB) pheromone trap counts to time insecticide applications to control ECB, we also compared catches in traps located at the edge of pepper fields with catches from traps located near corn fields on the same farm.

Background and Justification:

In a 1996 survey, 38% of New York fresh market vegetable growers reported growing peppers, making it the sixth most frequently grown fresh market crop (Hoffmann et al., 1997). Seventy percent of the growers reported growing less than 2 acres of peppers, with over 40% growing between 0.5 and 1 acre. Aphids and European corn borer were by far the most frequently reported pests of pepper, with corn earworm, cutworms, thrips, and Colorado potato beetle also reported by 4-11% of growers. Disease problems most frequently cited were bacterial leaf spot (BLS) and Phytophthora blight. In New York, IPM procedures have not been developed for or demonstrated in peppers, and growers have no specific guidelines for timing insecticide applications. The number of insecticide applications to peppers in New York for ECB and aphid control ranges between three and seven per season (M. Orfanedes, pers. comm., Knodel et al. 1997). Where BLS is present, growers may be applying copper/mancozeb sprays weekly, with no guarantee of success if the weather favors disease development.

In New England, IPM thresholds and procedures developed in Connecticut (CT) have been demonstrated for a number of years. In demonstrations in CT, the number of insecticide applications to peppers can be cut in half when while maintaining crop quality where insect thresholds are used, and copper/mancozeb applications eliminated by the use of BLS resistant varieties (1997 CT IPM Annual Report). Last season, demonstrations in three pepper fields showed that using the recommended aphid and ECB thresholds resulted in good quality fruit at harvest. Additional seasons of demonstrations will increase confidence in the thresholds and allow refinement for New York conditions.

Many of the insecticides currently recommended for use on peppers in NY are carbamates or organophosphates, and are under review by the EPA. Growers need to know how alternatives to the organophosphates and carbamates work against target pests and how they fit into a comprehensive pest management program.

Objectives:

1) Conduct split fields demonstrations of the New England IPM procedures for peppers with three New York pepper growers.

2) Compare ECB pheromone trap catches in traps set up at the edge of pepper fields with catches in traps set up near corn fields on the same farm.

3) Evaluate pepper quality at harvest, number of insecticide and bactericide sprays, environmental impact, and cost of adopting IPM practices compared with the grower's current practice.

Procedures

1) Demonstration fields were established on three different farms, designated M, F, and E. An IPM area was designated in each field. At the M and E locations, a BLS resistant variety was planted in the IPM area. At the F location, the grower was contacted about cooperating after a planned cooperator was unable to participate. No BLS resistant varieties were grown on that farm, so the IPM area contained susceptible varieties. Each area of the fields was scouted weekly, and the scouting records for both areas were given to the grower. In the IPM part of the fields, insects were managed using the following thresholds: for aphids an average of 8-10 per leaf; for ECB a total weekly catch of seven or more moths in the traps set up near the peppers when fruit were walnut-sized or larger. Growers were asked to apply insecticides only when the field was over threshold for these two pests. Growers were asked to use Spintor in the IPM areas for ECB control at all locations.
2) ECB-E and ECB-Z traps were set up in a grassy area at the edge of each pepper field and also near a corn field on the same farm. We used Scentry Heliothis net traps and Trece Inc. lures. Lures were replaced every two weeks.
3) Growers maintained spray records for both parts of the field. Fifty fruit were harvested from each area of the fields on each of three harvest dates during the period the growers were harvesting for market. Each pepper was cut open to look for ECB infestation.

Results and Discussion

The 2000 growing season was cool and wet, and planting and harvest were delayed at all three locations. The ECB flights were later and tended to be more spread out than usual. BLS symptoms were present in the susceptible varieties, and copper was applied, but BLS was not a serious problem this season, possibly because of the cool conditions. A few plants of the resistant variety planted at the M and E locations showed symptoms that were similar to BLS, prompting the growers to apply copper to the IPM area. Samples were sent off to Dave Ritchie, a plant pathologist in North Carolina, but *Xanthomonas campestris*, the bacteria causing BLS, was not isolated from the samples.

Aphids

Aphid numbers were low to non-existent at the M and E locations and the fields did not reach threshold in either the IPM or grower areas. At the F location, aphid numbers increased dramatically in both areas of the field in mid-August, and the grower applied Warrior to prevent sooty mold growth on the fruit. The Warrior application reduced the infestation below threshold in the IPM area but not in the grower area. The late season increase in aphids may have been due to the use of Warrior for ECB control in the grower area of the field. Trials conducted by Dan Gilrein on Long Island have shown that the use of pyrethroids can result in aphid outbreaks in peppers, possibly due to their detrimental effect on natural enemies.

Pheromone trap catches and ECB

Because the threshold for ECB is an absolute number of moths caught per week, the question of whether traps set up near sweet corn for the sweet corn pheromone trap network are sufficient for making decisions in peppers arises. This season, as last season, we did not see a consistently higher or lower trap catches in traps placed near corn compared with those near pepper fields (Figs 1-3), although the general flight trends were similar in traps placed near the two crops. However, the precision implied in the numerical threshold and specific trap placement brings up larger issues with using pheromone traps to time insecticide applications. Over the past seven years of trapping ECB near sweet corn fields, we have observed that some locations historically have higher trap catches than other areas. The threshold value of seven that we have been using would be considered a very low catch at some locations and moderately high at others. Using only pheromone trap catches to make spray decisions often results in a conservative recommendation and more insecticide applications than necessary. At historically high trap catch locations the threshold could call for as many as six insecticide applications. In addition, the CT recommendations do not specify a time or trap catch threshold for discontinuing insecticide applications. When ECB larvae were found in the fruit during harvest evaluations starting in late August, the majority were relatively large larvae, suggesting that most infestations occurred near the time of peak flight and that more than a couple of applications after the peak flight were not warranted. At one location this season ECB eggs were found on the plant before the pheromone traps near the field had caught a total of seven per week. One of the cooperating consultants has relied on scouting for ECB (adults in field and egg masses on leaves) to make spray decisions in peppers in the past. Using the trend in pheromone trap catches (rapid increase rather than absolute number) along with in-field indications of egg laying activity may result in fewer and more targeted applications against ECB.

Figure 1

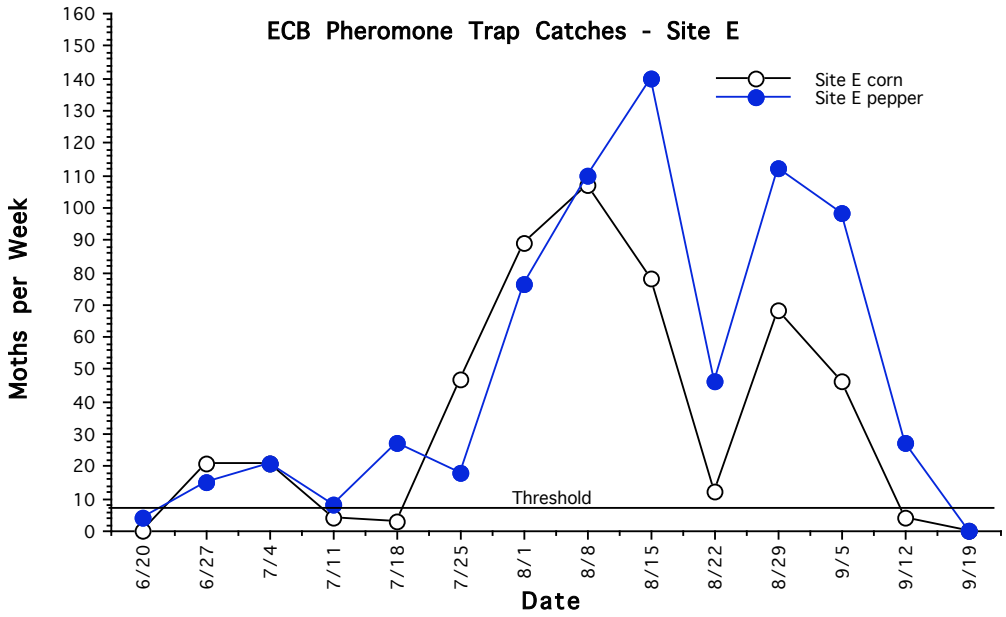


Figure 2

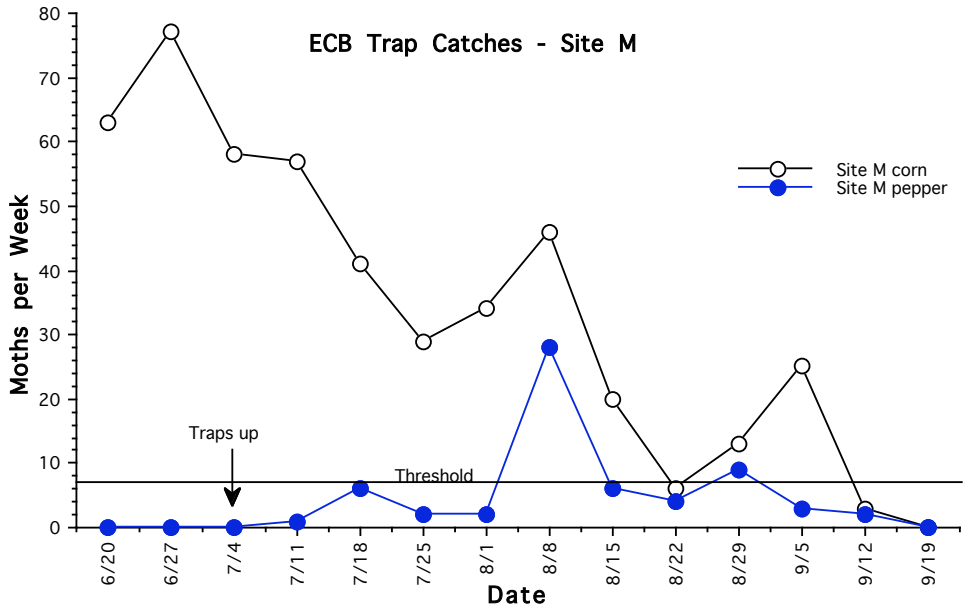
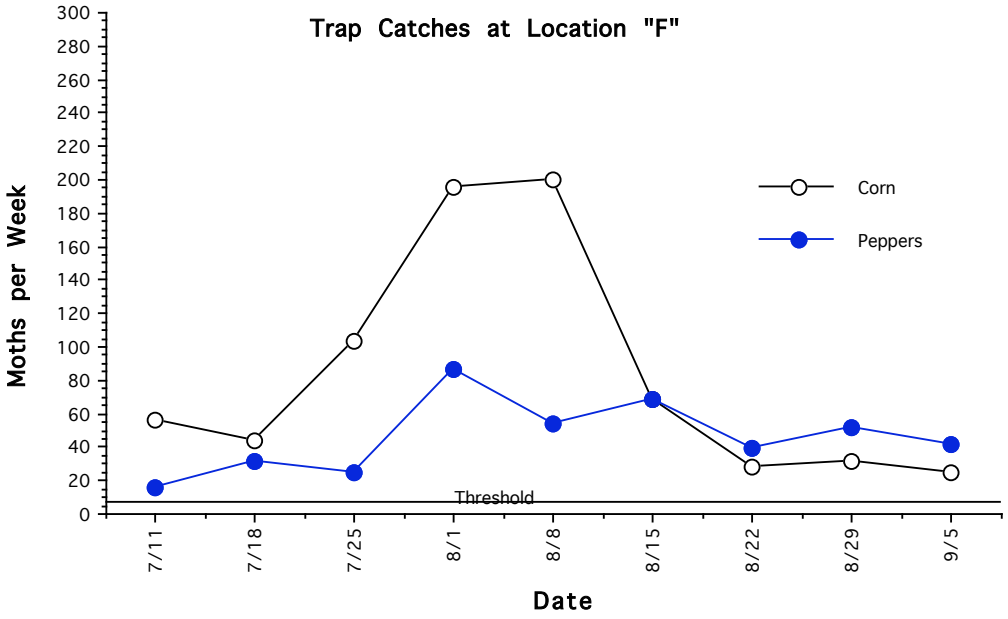


Figure 3



Pesticide use, cost, and EIQ

Table 1 shows spray records for the three fields. As we saw last season, copper applications increase the seasonal EIQ substantially. Using resistant varieties can eliminate the need for copper sprays. One of the cooperating growers liked the BLS resistant variety that they tried this season; the other did not. Because variety preference is very personal, it will be important to increase the number of resistant varieties to meet grower preferences if the use of resistant varieties is going to be widely adopted. In each field the use of Spintor and decreased use of copper resulted in substantially lower EIQ's for the IPM areas of the fields. However, pest management costs were higher in the IPM area in two if the three fields. None of the growers used Spintor on the weekly schedule that was recommended, and crop quality was acceptable, suggesting that weekly sprays through the entire ECB flight are not necessary.

Table 1

Site E	IPM				Grower			
Date M	Material	Rate/A	Cost/A	Field use EIQ	Material	Rate/A	Cost/A	Field use EIQ
7/1	Spintor 2 SC	4 oz.	$21.05	1.1	Admire 2000	16 oz.	$55.14	28.7
7/5	Spintor 2 SC	4 oz.	$21.05	1.1	Admire 2F	16 oz.	$55.36	NA
7/18					Vydate L	32 oz.	$14.96	19.2
					Kocide DF	2 lb.	$5.06	40.9
7/31	Champ	24 oz	$2.18	18.7	Manzate DF	1.5 lb.	$4.20	70.1
8/7	Spintor 2 SC	4 oz.	$21.05	1.1	Kocide DF	2 lb.	$5.06	40.9
8/4	Spintor 2 SC	4.8 oz	$25.30	1.3	Manzate DF	1.5 lb.	$4.20	70.1
8/14	Spintor 2 SC	4 oz.	$21.05	1.1	Spintor	12 oz.	$63.16	10.8
					Champ	24 oz.	$2.18	18.7
		Total	$111.68	24	Manzate DF	1.5 lb.	$4.20	70.1
8/28	Kocide DF	2 lb.	$5.06	40.9	Kocide DF	2 lb.	$5.06	40.9
	Manzate DF	1.5 lb.	$4.20	70.1	Manzate DF	1.5 lb.	$4.20	70.1
9/6	Kocide DF	2 lb.	$5.06	40.9	Kocide DF	2 lb.	$5.06	40.9
	Manzate DF	1.5 lb.	$4.20	70.1	Manzate DF	1.5 lb.	$4.20	70.1
9/15	Kocide DF	2 lb.	$5.06	40.9	Kocide DF	2 lb.	$5.06	40.9
	Manzate DF	1.5 lb.	$4.20	70.1	Manzate DF	1.5 lb.	$4.20	70.1
		Totals	$80.40	336		Totals	$151.59	687

Site F	IPM				Grower			
Date	Material	Rate/A	Cost/A	Field use EIQ	Material	Rate/A	Cost/A	Field use EIQ
7/8	Kocide DF	1.8 lb.	$4.55	59.3	Kocide DF	1.8 lb.	$4.55	59.3
	Manzate DF	0.6 lb.	$1.82	28	Manzate DF	0.6 lb.	$1.82	37.4
7/19					Warrior	3.2 oz.	$9.66	0.64
					Kocide DF	1.8 lb.	$4.55	59.3
					Manzate DF	0.6 lb.	$1.82	37.4
8/10	Spintor 2 SC	5 oz.	$26.31	1.4	Warrior	3.2 oz.	$9.66	0.64
	Kocide DF	1.8 lb.	$4.55	59.3	Kocide DF	1.8 lb.	$4.55	59.3
	Manzate DF	0.6 lb.	$1.82	37.4	Manzate DF	0.6 lb.	$1.82	37.4
8/19	Spintor 2 SC	5 oz.	$26.31	1.4				
	Ridomil copper	2.5 lb.	$32.59	53.5				
8/30	Spintor 2 SC	5 oz.	$26.31	1.4	Spintor 2 SC	5 oz.	$26.31	1.4
	Kocide DF	1.8 lb.	$4.55	59.3	Kocide DF	1.8 lb.	$4.55	59.3
	Manzate DF	0.6 lb.	$1.82	37.4	Manzate DF	0.6 lb.	$1.82	37.4
9/7	Warrior	3.2 oz.	$9.66	0.64	Warrior	3.2 oz.	$9.66	0.64
9/16					Warrior	3.2 oz.	$9.66	0.64
					Kocide DF	1.8 lb.	$4.55	59.3
					Manzate DF	0.6 lb.	$1.82	37.4
		Totals	$140.29	339		Totals	$96.80	487

Crop quality

The average levels of fruit infestation found in each area of the demonstration fields can be found in Table 2. Crop quality was not significantly different (ns) in the IPM area than in the rest of the field, and all the cooperating growers were satisfied with the crop quality in both parts of the fields.

Table 2

Location	Treatment	% ECB infestation	% CEW infestation	Total % infestation
E	IPM	7.8 ns	0.7 ns	8.5 ns
	Grower	11.4 ns	0.6 ns	12.0 ns
F	IPM	3.2 ns	0 ns	3.2 ns
	Grower	6.5 ns	0 ns	6.5 ns
M	IPM	7.6 ns	0.6 ns	8.2 ns
	Grower	5.6 ns	0.6 ns	6.2 ns

Next season we would like to refine the spray recommendations for ECB. Our results this season suggest that two or three applications at the time of peak moth flights may be as effective as additional sprays applied as the flight tapers off. This is an important consideration when using Spintor, which is both expensive and limited to a cumulative application of 29 oz per field per season.

CEW eggs were found in low numbers on leaves at two locations, and a CEW infested fruit was found at one location in which eggs were found and one in which eggs were not found. During years with early, heavy CEW flights, they will need to be taken into consideration when making spray decisions.